

Tactical Combat Casualty Care

August 2011



**Direct from the Battlefield: TCCC
Lessons Learned in Iraq and
Afghanistan**



TCCC Lessons Learned in Iraq and Afghanistan

- Reports from Joint Trauma System (JTS) weekly Trauma Telecons - every Thursday morning
 - Worldwide telecon to discuss every serious casualty admitted to a Level III hospital from that week
- Published medical reports
- Armed Forces Medical Examiner's Office reports
- Feedback from doctors, corpsmen, medics, and PJs





Train ALL Combatants in TCCC

- Potentially preventable deaths averaging about 20% of all fatalities
- Units that train all members in TCCC have drastically reduced this incidence
- Need to train **ALL** combatants in TCCC





Fatal Extremity Hemorrhage

This casualty was wounded by an RPG explosion and sustained a traumatic amputation of the right forearm at the mid-forearm level and a right leg wound. He bled to death from his leg wound despite the placement of three field-expedient tourniquets.

What could have saved him?

C.A.T. Tourniquet
TCCC training for all

unit members
*Note: Medic killed

at
point of action





Tourniquets

- **Get tourniquets on BEFORE onset of shock**
 - Mortality is very high if casualties already in shock before tourniquet application
- **If bleeding is not controlled and distal pulse not eliminated with first tourniquet - use a second one just proximal to first**
 - Increasing the tourniquet WIDTH with a second tourniquet controls bleeding more effectively and reduces complications





Tourniquet Case Report

Afghanistan - Nov 2009

- Soldier with gunshot wound to left leg
- Open fracture left femur
- Injury to popliteal artery and vein
- Three CAT tourniquets placed
- Life saved
- Leg doing well
- **2-3 casualties/week saved with tourniquet**





Tourniquets

- **Tighten velcro band on tourniquets as tight as possible before starting to use windlass - a loose velcro band contributes to tourniquet malfunction**
 - Should be effective with approximately three degree turns of windlass
 - Use second tourniquet if needed





Tourniquets

- **Fake CAT tourniquets that are prone to malfunction are turning up in theater - ensure that you have this NSN tourniquet:**
- **NSN 6515 01 521 7076**





Counterfeit C-A-Ts



DEFENSE LOGISTICS AGENCY
DEFENSE SUPPLY CENTER PHILADELPHIA
700 ROBBINS AVENUE
PHILADELPHIA, PENNSYLVANIA 19111-5092

**IN REPLY
REFER TO**

DSCP-FSFB 10-150

April 14, 2010

MEMORANDUM FOR USAMMA, NAVMEDLOGCOM, AFMLO, MARCORSYSCOM, DMMPO.

SUBJECT: QUALITY ASSURANCE URGENT PRODUCT SAFETY ALERT.

1. REFERENCES:

- A. ITEM: Tourniquet, Nonpneumatic; C-A-Tourniquet®. NSN 6515-01-521-7976.
- B. Item No(s): NAR-CAT, 30-0001 Serial/Lot No(s): N/A
- C. Manufacturer: Composite Resources, Inc., 485 Lakeshore Parkway, Rock Hill, SC
- D. Distributors:

North American Rescue Inc., 35 Tedwall Court, Greer, SC;

Cardinal Health, 1430 Waukegan Road, McGaw Park, IL

Owens and Minor, 9120 Lockwood Blvd, Mechanicsville, VA;

American Purchasing Services (DBA American Medical Depot) 4380 NW 135th St, Opa Locka, FL;

Phoenix Textile Corporation, 21 Commerce Drive, O'Fallon, MO

E. Authorized for procurement through DoD Supply Chain Only.

2. SAFETY ALERT: CRITICAL LIFE-SAVING ITEM.



Counterfeit C-A-Ts

2. SAFETY ALERT: CRITICAL LIFE-SAVING ITEM.

A. REASON: DLA has become aware of similar products manufactured to closely resemble the C-A-Tourniquet® and available for purchase through non-DoD websites. Authorized DoD procurement gateways will supply only the approved commercial part from authorized distributors. These products were first encountered several years ago in a depot in Afghanistan and thought to have been purged from the system. They were then of obvious inferior construction and quite recognizable as a substitute for the real thing. Today the product is very difficult to distinguish from the C-A-Tourniquet® down to duplicate markings and symbols.

Although there is no direct evidence against these duplicate products, several reports indicate that they are of inferior design and may cause serious injury or death.

B. RECOMMENDED STRATEGY: The above distributors, supplying the Composite Resources product exclusively, are the only authorized source for this device.

The FDA regulates this product as a Class 1 device, which means that there is no requirement for a premarket notification application and FDA clearance is not required before marketing the device in the U.S. However, these manufacturers are required to register their establishment with FDA.

If you have purchased these devices from any other source, it is recommended that they be suspended from use and replaced by the recommended product. Please report suspended quantities to your logistical supply office.

Some examples of non-authorized Internet sources for duplicate product that may be hazardous are:
www.world-element.com; ID No. EX 159; and

http://www.airsoftglobal.com/product_info.php?products_id=11454; ID EL-ACC-EX159-AG.

CAT (GEN III) vs. F-CAT

Executive Summary

Introduction:

1. The Element Cat (E-CAT) is a very carefully made counterfeit CAT tourniquet.
2. It is manufactured in Hong Kong for \$8.50 (USD) per item.
3. There are no limits to the number that can be purchased.
4. They are available on the internet, and anyone can purchase them.
5. They were designed to look, feel and act like a CAT (GEN III).
6. They ARE a counterfeit tourniquet.



CAT (GEN III) vs. F-CAT

Executive Summary

CAT (GEN III)

Package from NARP, Inc.
Looks nothing like the F-CAT package.

E-CAT:

Packaged in plastic bag
with paper top.

The sticker on the bag call
the tourniquet the “Combat
Application Tourniquet”
and lists the NSN assigned
to NARP.

CAT



E-CAT





CAT Generation VI

10/06/2009

Length of Tourniquet changed to 37 1/2"

Manufacturer and Lot Stamp with date manufactured added to the strap





Ft. Hood Shootings 2009

Officer Kim Munley

- 12 dead; 31 wounded on 5 Nov 09
- Officer Munley got shooter; shot in both thighs
- Direct pressure and makeshift tourniquets used by several physicians unsuccessful at controlling hemorrhage
 - went into shock
- Saved by Army 68W medic with a C-A-T on left thigh





Tourniquet on Uninjured Arm

- JTS Trauma Telecon 8 April 2010
- IED casualty
- Arrived at Kandahar with C-A-T in place on left arm
- Evaluation: no injuries sustained on left arm
- Follow-up: No explanation available
- Lessons Learned:
 - No injury = No tourniquet
 - Remember to reassess your casualties



Wear Your Eye Protection!

- Jan 2010
- 22 y/o near IED without eye protection
- Now blind in both eyes
- Don't let this happen to you - see slides below



With eye pro - eyes OK



Without eye pro - both eyes



Eye Armor - It Works!





Penetrating Eye Trauma

- **Rigid eye shield for obvious or suspected eye wounds - often not being done - SHIELD AND SHIP!**
- Not doing this may cause permanent loss of vision
- use a shield for any injury in or around the eye
- Eye shields not always in IFAKs



Shield after injury



No shield after injury



Eye Protection



- Use your tactical eyewear to cover the injured eye if you don't have a shield.
- Using tactical eyewear in the field will generally prevent



JTTS Trauma Telecon

9 Sept 2010

- Recent case of endophthalmitis (blinding infection inside the eye)
- Reminder - shield and moxifloxacin in the field for penetrating eye injuries
- Also - need to continue moxi both topically and systemically in the MTFs
- Many antibiotics do not penetrate well into the eye





Patched Open Globe

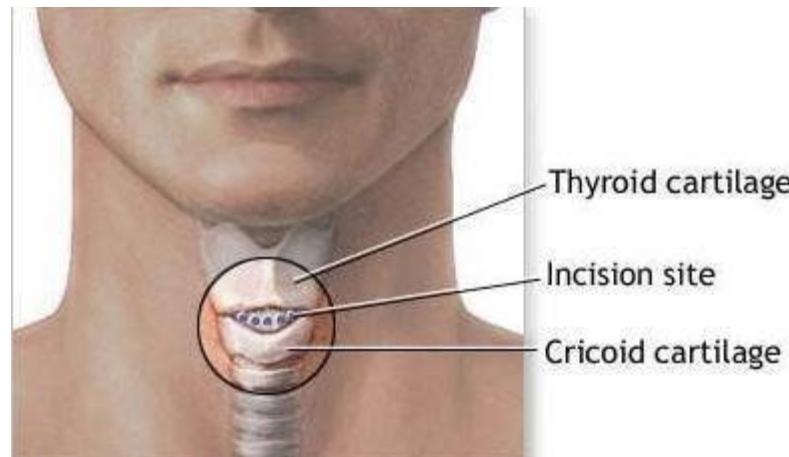
22 July 2010

- Shrapnel in right eye from IED
- Had rigid eye shield placed
- Reported as both pressure patched and as having a gauze pad placed under the eye shield without pressure
- Extruded uveal tissue (intraocular contents) noted at time of operative repair of globe
- **Do not place gauze on injured eyes! COL Robb Mazzoli: Gauze can adhere to iris tissue and cause further extrusion when removed even if no pressure is applied to eye.**



Surgical Airways

- Joint Trauma System e-mail of 24 September 09
- 3 field crics done incorrectly in OIF
- One was done through the center of the thyroid cartilage and through one of the vocal cords





Surgical Airways: The Rest of the Story

“The setting of the casualty care was at night in a non-permissive environment. The medic had sustained a sacral injury and damaged his NVG's during a hard landing on infil. The casualty had sustained a gunshot wound to the jaw. The medic was not called to the scene for ten minutes due to an ongoing firefight. The jaw was shattered and he had heavy maxillofacial bleeding. The recovery position was attempted repeatedly, but the casualty refused to remain like that.

Anxiolysis was attempted with Versed to facilitate maintaining the airway with position alone, but did not work. The casualty became increasingly combative and the decision was made to perform the cric out of fear of completely losing the airway during evacuation. Due to the fact that the medic's NVGs were damaged, an operator (former 18D with two successful prior combat cric's) attempted the procedure with assistance by the medic. By then all landmarks had disappeared due to soft tissue swelling of the neck. Although complications resulted from the procedure, a definitive airway was established under extremely difficult conditions and the casualty lived.”



Surgical Airways

Recommendations:

- Live tissue training for this procedure if possible
- “Sim Man” trainer may be second-best option
- Don’t attempt surgical airway just because the casualty is unconscious
- Try the “sit-up and lean forward” position prior to attempting a surgical airway

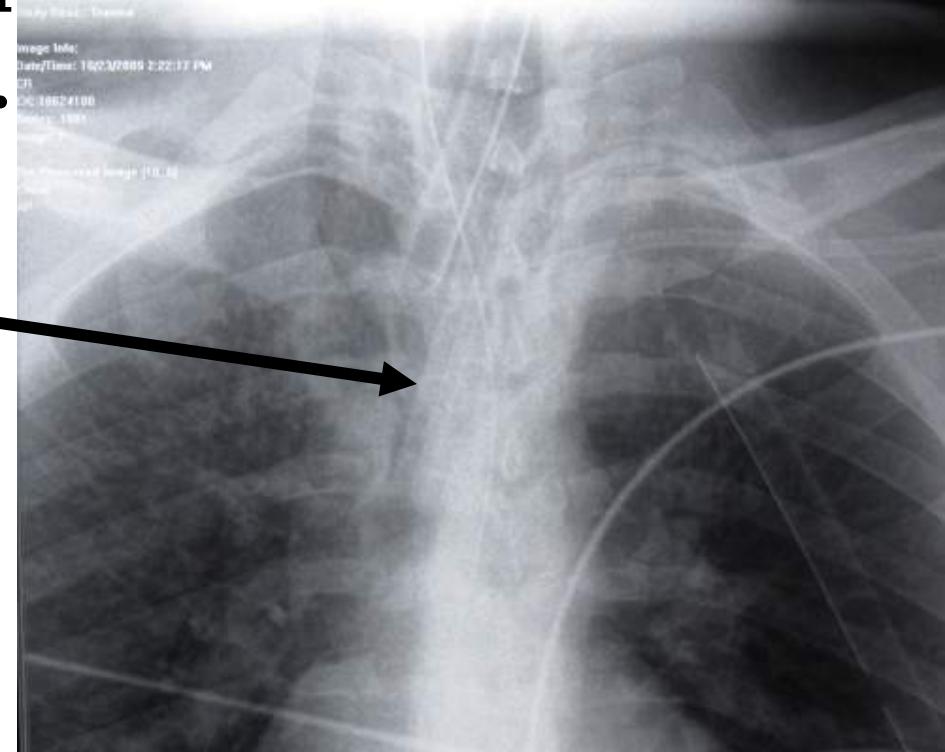




Surgical Airways

If you cut the endotracheal tube, you must tape it very securely or the tube will slip down into the trachea, cease to function correctly and have to be surgically removed.

Like this one....





IED Casualties

- IED blast casualties often have multiple mechanisms of injury
 - Blunt trauma
 - Penetrating trauma
 - Blast
 - Burns
- Majority of casualties are now from IEDs





IED Casualties

- IED casualties - many have spinal fractures,
especially thoracic
- Try to maintain spinal alignment
in blunt
trauma casualties





IED Casualties

- IED events - be alert for secondary IEDs or ground assaults after initiation of the IED





Do Aviation Personnel Need TCCC?

In-Flight Tourniquet 24 June 2010

- AF Pave Hawk pilot on EVAV mission to pick up wounded UK soldier
- GSW both legs
- Severe bleeding R leg
- PJ crawled up into cockpit and applied tourniquet
- Bleeding controlled - pilot completed mission



JTS Trauma Telecon

26 Aug 2010

- **23 y/o male**
- **GSW left infraclavicular area with external hemorrhage**
- **“Progressive deterioration”**
- **External hemorrhage noted to increase as casualty resuscitated in ED**
- **No record of Combat Gauze use**
- **All injuries noted to be extrapleural**
- **Lesson learned: see following slide**



Combat Gauze™



It doesn't work if you don't use it.

FEEDBACK TO THE FIELD:

Perforation of the Sternum by an Intraosseous Infusion Device

H T Harcke, COL, MC, USA

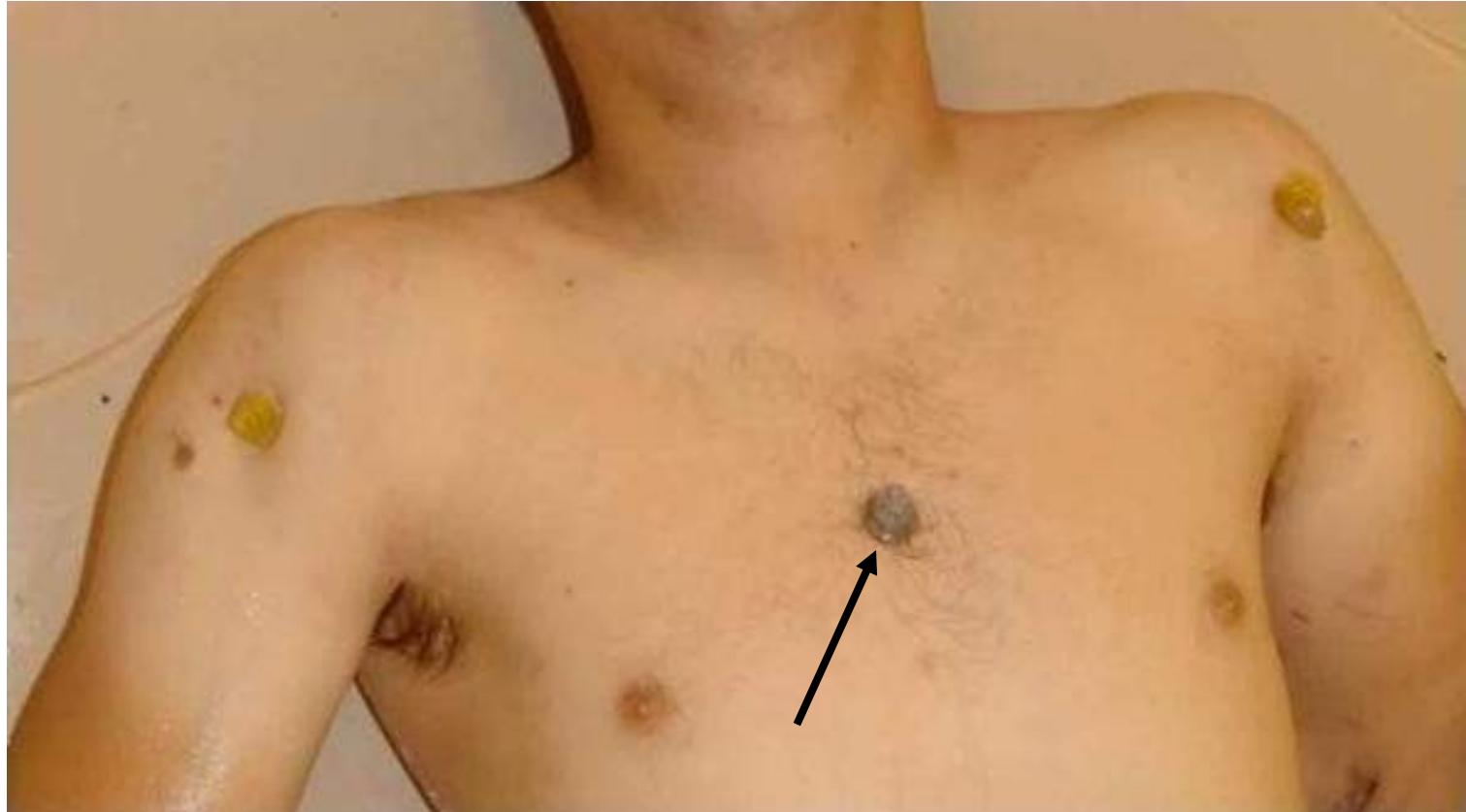
Chief, Forensic Radiology
Armed Forces Institute of Pathology

E Mazuchowaski, Lt Col (Sel), USAF, MC

Deputy Medical Examiner
Office of the Armed Forces Medical Examiner

CASE OVERVIEW

- IED detonated in the decedent's vicinity.
- Catastrophic injury to the lower extremities and pelvis, to include traumatic amputation of the lower legs.
- Emergency treatment included tourniquets, sternal IO-IV, and proximal humeral IO-IV's.



Note sternal IO in place

Autopsy CT Scan

Sagittal MDCT image shows the IO-IV needle passes through the sternum with the tip in the anterior mediastinum (arrow).



This is NOT where you want the infused fluid!



Comparison of
the devices:

Note size, color
and packaging
differences.



Do you really want to try to tell these
two IO needles apart in the dark in a
tactical mass casualty scenario?



Ready Heat Skin Burns

- Do **NOT** place the ready-Heat Blanket directly on the skin - multiple reports of skin burns from this being done
- Keep compression tape on T-ducts on





Halon in a Combat Medic Presentation

- Scenario from Afghanistan
- Casualties inside vehicles during and after AFES discharge
 - “Smoldering” inside vehicle during casualty treatment
- Total time of exposure to fire suppression agent unknown
- Halon blamed for subsequent pulmonary sx in casualties and medic
- Halon off-gassing from casualties’ clothing in helo?



What is “Halon”?

- Halons are a group of chemical compounds consisting of hydrogen and carbon with linked halogens like bromine
 - There are many commercial halons with many uses, including fire suppression
 - Halon 1301 used in fire suppression systems in tactical vehicles phased out in mid-1990s
 - Army was lead agent for selecting replacement compounds for fire suppression



Possible Toxic Byproducts

- Fires in tactical vehicles can produce a variety of toxic byproducts:
 - Nitrous oxide, nitrous dioxide
 - Carbon monoxide, carbon dioxide
 - Hydrofluoric acid, hydrochloric acid, hydrogen cyanide
 - Acrolein, formaldehyde
- These are all pulmonary irritants!



Field Treatment for Smoke and Toxic Fume Inhalation

- Prevent by removing the casualty from the burning vehicle as quickly as possible
- Pulse oximetry monitoring
- Aggressive airway management
- Documentation of smoke exposure
- Oxygen when available if oxygen saturation is low or if casualty is having respiratory difficulty



JTS Trauma Telecon

2011

- Casualty with a gunshot wound to the neck
- Airway was obstructed with blood
- Medic noted air bubbles coming from the tracheal wound
- No need for an incision in this case - the medic put a cric tube directly into the trachea through the wound
- Held it there until the casualty got to a hospital
- Casualty did well - great save
- With penetrating neck wounds, follow the bubbles if you see them!



Questions?



Direct from the Battlefield

Additional Information on Halon



AFES Performance Criteria

PARAMETER	REQUIREMENT
Fire Suppression	Extinguish all flames without re-flash
Skin Burns	Less than second degree burns ($<2400^{\circ}\text{F}\cdot\text{sec}$ over 10 seconds or heat flux $< 3.9 \text{ cal/cm}^2$)
Overpressure	Less than 11.6 psi
Agent concentration	Not to exceed LOAEL*
Acid gasses	Less than 1,000 ppm peak
Oxygen levels	Not below 16%

* LOAEL – Lowest Observed Adverse Effects Level

From MEDCOM: Swanson, Dennis, "Fire Survivability Parameters for Combat Vehicle Crewmen," Department of the Army, Office of the Surgeon General, 20 February 1987.



US Army Ground Vehicle Crew Compartment Halon Replacement Program (U)

- HFC-227ea
 - Heptafluoropropane (CF₃CHFCF₃)
 - Ozone Depletion Potential = 0
 - LOAEL = 10.5% by volume.
 - NOAEL = 9% by volume.
 - Decomposes by reaction with high temperature (open flames, glowing metal surfaces, etc.) forming hydrofluoric acid, carbonyl fluorides, carbon monoxide and carbon dioxide.
 - Leaves no residue

Mike Clauson and Steve McCormick, US Army Tank-automotive and Armaments Command
AMSTA-TR-R / 263
Warren, MI 48397-5000
(810) 574-5948



ASSESSMENT OF THE FIRE SUPPRESSION MECHANICS FOR HFC-227ea COMBINED WITH NaHCO³

Table 4. (U) Phase II (w/clutter) Baseline Test Data

Agent ‡	Total Weight (lbs.)	Bottle Config # x in ³	IR fire-out (msec)	Video fire-out (msec)	2-Min Ave HF (ppm)	Peak HF (ppm)
1301	9.9	3x144	777-1023	750-1000	2063	10348
1301	16	4x144	159-167	150-180	1789	3483
1301	12	4x144	179-193	180-220	1472	2031
1301	10	4x144	189-268	220-250	1086	1302
FM-200	16	4x144 §	172-216	180-240	844	1051
FM-200	12	4x144	185-220	190-260	1344	1636
FM-200 + BCS †	12+1	4x144	173-214	180-220	70	134

‡ - All tests used the ‘standard’ Army equipment bottles, valves and nozzles.

R. REED SKAGGS
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Aberdeen Test Center
Aberdeen Proving Ground, MD 21005-5059
(410) 278-5020



Possible Fires in Tactical Vehicles

- Class A fires involving air filters, canvas, paper
- Class B hydrocarbon fuel fires fed by vehicle fuel, hydraulic fluid, lubricants, and miscellaneous materials such as paint
- Class C electrical fires including batteries
- Class D ammunition fires.